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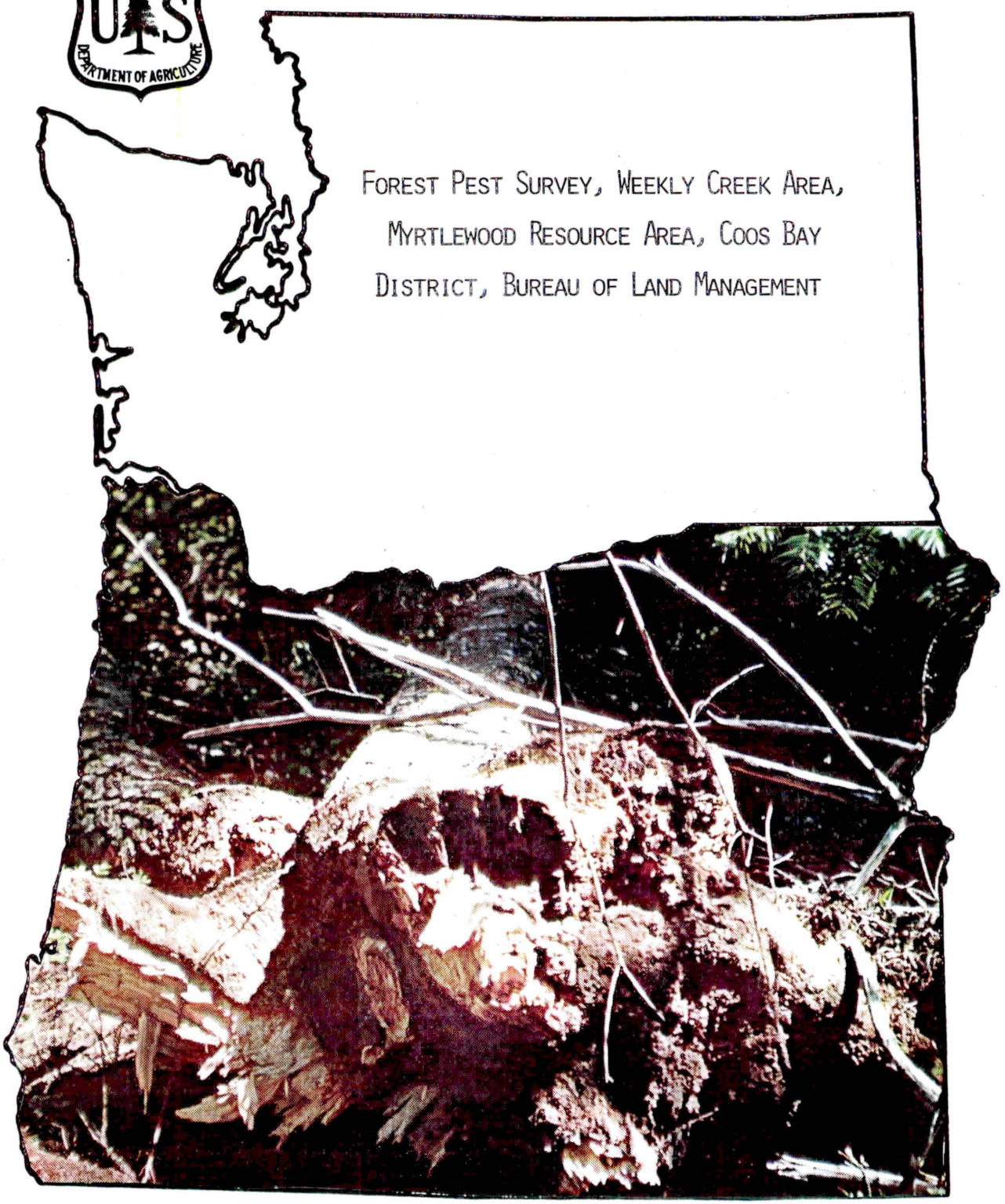
Forest Pest Management
Pacific Northwest Region

FOREST PEST SURVEY, WEEKLY CREEK AREA,
MYRTLEWOOD RESOURCE AREA, COOS BAY
DISTRICT, BUREAU OF LAND MANAGEMENT



March 1983

Forest Pest Survey, Weekly Creek Area, Myrtlewood Resource Area, Coos Bay District, Bureau of Land Management

By

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Introduction

During the weeks of August 1-12, 1982, a FPM pathology crew did a pest survey of stands in the Weekly and John Creek Drainages, Myrtlewood Resource Area, Coos Bay District, Bureau of Land Management (T. 28 S., R. 11 W., sec. 31 and T. 29 S., R 11 W., sec. 5 and 7). District personnel had noticed tree mortality and blowdown in this area and suspected that laminated root rot was responsible. They requested a biological evaluation to determine distribution of disease and insect activity and to provide pest management recommendations. They were concerned with conditions throughout the area but were especially interested in possible pest problems in six 1982 and 1983 timber sale units.

Methods

The six timber sale areas (figure 1) were surveyed systematically using variable plots. A Spiegel-Relaskop was employed to define plots (basal area standard = 40). Plots were located on a 4x2 chain grid across each unit. Data were taken on all trees in plots that contained dead or declining trees and in every fifth healthy plot. The following information was recorded for each "in" tree: species, DBH, general condition (live, dead, standing, down), and, where appropriate, diseases or insects present. Two roots on opposite sides of each recently dead or symptomatic tree were excavated to a distance of 3 feet from the root collar and examined for evidence of stain, decay, or fungus mycelia. Roots and butts of old dead trees were dissected to determine character of wood decay. Trunks were examined for signs and symptoms of heart rot and crowns were examined for evidence of foliage diseases and mistletoes. Bark was removed from the stems of bark beetle-infested trees to expose galleries for beetle species determination. From data collected in plots, mean basal area and number of trees per acre by tree species, DBH class, and condition were calculated for each unit.

In addition to collecting data in plots, the survey crew reconnoitered areas between plots and lines and prepared maps of each sale area showing the location of all root disease centers encountered. Boundaries were determined based on occurrence of dead or symptomatic diseased trees.

Because of time limitations, other stands in the Weekly and John Creek areas were examined less intensively. Stands were stratified based on examination from the road, from overviews that allowed onlookers to see much of each drainage, and from aerial photographs. Stands with tree mortality patterns that resembled root disease centers were walked through and dead or symptomatic trees examined for root diseases and other pests. A general assessment of disease conditions in each stand was made, but basal area and tree per acre data were not obtained.

Results and Discussion

Stands surveyed were dominated by Douglas-fir (*Pseudotsuga menziesii*) and contained lesser amounts of western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), and western redcedar (*Thuja plicata*). Ages of trees examined ranged from 90 to 200 years. Mean basal areas and numbers of trees per acre for the six units that were surveyed intensively are summarized by species, DBH class, and condition in Tables 1-6.

For the entire Weekly-John Creek drainages, forest pest damage was not as great as originally had been thought. Nevertheless, some areas within the evaluation block were suffering rather substantial disease and insect-caused losses. Laminated root rot (caused by *Phellinus weirii*) was severe in some stands, and black stain root disease (caused by *Ceratocystis wageneri*) was found along one road. Scattered mortality caused by Douglas-fir beetles (*Dendroctonus pseudotsugae*) was found throughout the evaluation block. Forest managers formulating harvest and silvicultural prescriptions for stands in the John Creek and Weekly Creek Drainages should consider these pests in their planning. Each is discussed in more detail in the following sections.

Laminated Root Rot - By far the most frequently encountered and damaging disease in the evaluation block was laminated root rot. This disease was identified by the typical, laminated wood decay that separates readily at the growth rings; the reddish, whiskery setal hyphae that appear between the sheets of rotted wood; and the grayish, crusty ectotrophic mycelia on root bark. Laminated root rot centers encountered in the surveys contained both dead standing trees and windthrows with roots rotted off just below the root collar to form characteristic "root balls."

Laminated root rot is a particularly dangerous disease because of its devastating effect on the host and because the causal agent is persistant on the site. The fungus can survive for up to 50 years in roots of old stumps and infect, via root contacts, hosts that become established on the site. Infection centers develop and increase in size due to subsequent spread from tree to tree along roots.

Recommended control for laminated root rot is to harvest all susceptible hosts in infection centers and a 50 foot buffer around each, and (1) mechanically remove all inoculum (infected roots and stumps) with heavy equipment, or (2) leave inoculum but replant with immune, resistant, or intermediately susceptible tree species that are adapted to the site. Mechanical removal of innoculum is effective and allows the manager to replant with any tree species desired, but it is expensive, difficult on steep terrain, and may contribute to substantial soil damage. Unless an infected stand is on a level, high-quality site with a relatively light soil, tree species manipulation in disease centers is usually a more viable control alternative.

In the Weekly-John Creeks area, tree species by increasing degree of susceptibility are immune - hardwoods; resistant - western redcedar; intermediately susceptible - western hemlock; highly susceptible - Douglas-fir and grand fir. If only immune species are planted on an infected site and grown for a rotation (50 years or more), *P. weirii* will die out, and a highly susceptible species such as Douglas-fir could be grown in the following rotation with almost no likelihood of additional losses. If resistant species are used, there should be much the same result, although there may be a small amount of infection and retention of the pathogen. If intermediately susceptible species are grown for a rotation, they should suffer relatively little apparent damage. However, many may be infected, a few may die, and the disease will be maintained on the site. Planting with highly susceptible species in the subsequent rotation will result in a renewed and magnified disease problem.

Black Stain Root Disease - Black stain root disease was found in a small number of relatively large Douglas-fir trees (DBH 10-30 inches) adjacent to roads in the survey area. The disease was identified by the dark brown to black stain it causes in sapwood of roots and lower boles of infected trees. Black stain is usually a disease of 15- to 25-year-old Douglas-fir plantations, so its occurrence in large trees in the Weekly-John Creeks area is rather unusual.

The causal fungus of the black stain disease is spread in two ways. Long distance spread is by insect vectors. Vectors are scolytid and curculionid beetles that prefer or are most successful on low-vigor or injured trees. Hence, the common occurrence of infection centers along roads where there are many damaged trees probably reflects vector preference. Once the pathogen is established, it spreads to other nearby trees of any vigor class via root contacts and grafts. This kind of spread can be quite rapid (12 feet or more per year).

The black stain fungus is non-persistent (it dies with its host). Therefore, for an infection center to remain active, there must be a continuous network of living host roots for the fungus to invade as it progressively kills infected trees. In locations where the disease is severe enough to justify control, spread of the disease can be stopped and the pathogen eliminated from an infection center by cutting all Douglas-firs within the center and a 50 foot buffer. The site can then be replanted immediately with a nonhost (anything except Douglas-fir) or it can be replanted with Douglas-fir as soon as all residual Douglas-fir roots are completely dead (at least one year after cutting). Another control strategy for black stain is to minimize likelihood of disease establishment in stands that have the potential to be affected by maintaining good vigor and avoiding tree injury.

Douglas-fir Beetles - Scattered, dead standing Douglas-firs that had been infested by Douglas-fir beetles were found throughout the survey area. Douglas-fir beetles were identified by their long, vertical adult galleries with alternating groups of horizontally branching larval galleries.

For the most part, Douglas-fir beetles are not primary tree killers. They usually attack and breed in severely weakened or windthrown trees. However, if there are many such suitable trees in a stand, beetle populations may build up to high levels. The beetles may then infest nearby healthy trees. In the survey area, beetle-caused mortality was most common near steep slopes where there was evidence of substantial amounts of past blowdown, in disturbed areas along roads, and in and around laminated root rot centers.

Control of Douglas-fir beetles is attained by promoting and maintaining a vigorous stand. Injured trees should be removed before beetles can attack, and windthrown trees should be salvaged either before they are infested or before the next generation of beetles emerges.

MANAGEMENT RECOMMENDATIONS

The following specific pest management recommendations are suggested for the Weekly-John Creeks block:

Intensively Surveyed 1982 and 1983 Sales

(1) Weekly Creek Units 1, 2, 3, and Sugar Loaf Unit 2 - These units are not affected by root diseases and can be harvested and regenerated in a normal fashion with Douglas-fir. Weekly Creek Units 1 and 2 have evidence of slightly more past Douglas-fir beetle activity than other intensively surveyed stands. Bark beetle activity appears to have been associated with blow down. To minimize loss from this source, we recommend that future stand vigor be maintained at as high a level as possible through cultural practices (stocking control, etc.) and that future rotation lengths not exceed 120 years.

(2) J7U Sale #3 - This unit has one discrete laminated root rot pocket in the northeast corner (figure 2). Area affected is very small. We recommend that following harvest, this disease center and a 50 foot buffer be planted with western redcedar. The remainder of the stand can be treated in the same way as the disease free units.

(3) J7U Sale #2 - This unit has severe laminated root rot distributed as shown in figure 3. In addition to currently detectable mortality caused by root rot (table 5), affected parts of the stand exhibit considerably lower stocking than do disease free areas. Our survey data indicate that disease centers have only 19 percent as many trees and 25 percent as much basal area as healthy portions of the same stand. We recommend that following harvest, the diseased portion of J7U #2 be treated by either (a) physically removing stumps or (b) leaving stumps but replanting with red alder, western redcedar or western hemlock (preferably the former two species). The disease-free eastern and western quarters of the stand can be regenerated with Douglas-fir.

Less Intensively Surveyed Portions of the Weekly-John Creeks Block

(1) Areas with Severe Laminated Root Rot - Two root rot areas (A and B, figure 1) were identified outside of the intensively surveyed units. We make the following recommendations for these stands: (a) in planning future timber sales for the Weekly-John Creeks area try to include these concentrations of root rot centers in units to be harvested relatively soon; (b) when new sales that include the root rot centers are laid out, have FPM survey them and prepare maps showing the precise location of root rot pockets; and (c) following harvest, treat root rot pockets and a 50 foot buffer by inoculum removal (stump removal) or tree species manipulation.

(2) Potential Areas of Douglas-fir Beetle Infestation - Unharvested stands throughout the Weekly-John Creeks block have continuing potential for Douglas-fir beetle damage if populations build up in windthrown and injured trees. To minimize loss throughout the block, we recommend that active salvage operations be carried out in portions of the Weekly-John Creeks Basin with good

access whenever blowdown of more than five trees per acre occurs. Broken and windthrown trees should be removed before April of the year following that in which they fall. Every effort should be made to avoid injury to residual trees during salvage operations. Root rot control and removal of injured roadside trees also will limit Douglas-fir beetle activity.

(3) Area with Black Stain Root Disease - Black stain root disease was detected in a few trees along the road between J7U #2 and #3 sale areas (figure 1, C). Only a small number of trees are affected and we do not recommend any specific treatment at this time. However, in view of the presence of the disease here and the known large amount of black stain root disease in not-to-distant plantations on the Tioga Resource Area, we believe that 15- to 25-year-old plantations in the Weekly-John Creeks area have some potential to be damaged by black stain in the future. To minimize the probability of this happening, we recommend that (a) rotating brush cutters not be used in plantations to clear roadsides, especially near the area where black stain is already known to exist, (b) if at all possible, new roads that are to pass through harvested units be built before plantations are established on the units, (c) high-lead cables not be dropped into existing young plantations during harvest of adjacent stands, and (d) tractor logging systems be used as infrequently as possible.

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Table 1: Mean number of trees and square foot basal area (in parenthesis) per acre by DBH, tree species, and condition for Weekly Creek Unit 2. The Unit is 32 acres in size.

DBH	Douglas-fir		Western Hemlock	Western Redcedar	Grand Fir
Class	Live	Bark Beetle Killed	Live	Live	Live
8	0	0	9.1 (3.2)	0	0
10	0	0	0	0	0
12	0	0	0	0	0
14	0	3.0 (3.2)	3.0 (3.2)	6.0 (6.4)	0
16	0	0	0	0	0
18	1.8 (3.2)	0	0	1.8 (3.2)	0
20	2.9 (6.4)	0	0	1.5 (3.2)	0
22	0	1.2 (3.2)	0	0	0
24	2.0 (6.4)	0	0	0	0
26	0.9 (3.2)	0	0	0	0
28	3.0 (12.8)	0.7 (3.2)	0	0	0
30	2.6 (12.8)	0	0	0	0.6 (3.2)
32	1.8 (9.6)	0.6 (3.2)	0	0	0
34	1.0 (6.4)	0	0	0	0
36	0.9 (6.4)	0	0	0	0
38	0.8 (6.4)	0	0	0	0
40	0.7 (6.4)	0.4 (3.2)	0	0	0
42	0.3 (3.2)	0	0	0	0
Total All classes	18.6 (83.2)	5.9 (16.0)	12.1 (6.4)	9.3 (12.8)	0.6 (3.2)

Table 2: Mean number of trees and square foot basal area (in parenthesis) per acre by DBH, tree species, and condition for Weekly Creek Unit 3. The Unit is 38 acres in in size.

DBH Class	Douglas-fir		Western Hemlock	Western Redcedar	Grand Fir
	Live	Bark Beetle Killed	Live	Live	Live
8	0	0	0	0	0
10	0	0	4.4 (2.4)	0	0
12	0	0	0	0	0
14	2.2 (2.4)	0	0	0	0
16	0	0	0	0	0
18	0	0	0	0	0
20	0	0	0	1.1 (2.4)	0
22	0	0.9 (2.4)	0	0	0
24	0	0	0	0	0
26	0.6 (2.4)	0	0	0	0
28	1.1 (4.8)	0	0	0	0
30	1.0 (4.8)	0	0	0	0
32	0	0	0	0	0.4 (2.4)
34	0.4 (2.4)	0	0	0.4 (2.4)	0
36	1.1 (7.6)	0.3 (2.4)	0	0	0
38	0.6 (4.8)	0	0	0	0
40	0.3 (2.4)	0	0	0	0
42	0.2 (2.4)	0	0	0	0
44	0.4 (4.8)	0	0	0	0
46	0	0	0	0	0
	0.2 (2.4)	0	0	0	0
Total All Classes	8.1 (41.2)	1.2 (4.8)	4.4 (2.4)	1.5 (4.8)	0.4 (2.4)

Table 3: Mean number of trees and square foot basal area (in parenthesis) per acre by DBH, tree species, and condition for Weekly Creek Unit 1. The Unit is 35 acres in size.

DBH	Douglas-fir			Western Hemlock	Western Redcedar	Grand Fir
Class	Live	Bark Beetle Killed	Dead Other Cause	Live	Live	Live
8	0	0	0	0	0	0
10	0	0	0	0	0	0
12	0	0	0	4.1 (3.2)	0	0
14	0	0	0	0	0	0
16	2.3 (3.2)	0	0	2.3 (3.2)	0	2.3 (3.2)
18	0	0	0	0	0	0
20	1.5 (3.2)	0	0	1.5 (3.2)	0	0
22	5.0 (13.2)	1.2 (3.2)	1.2 (3.2)	0	0	0
24	3.2 (10.0)	0	0	0	0	0
26	0.9 (3.2)	0	0	0	0	0
28	2.3 (10.0)	0	0	0	0	0
30	0.6 (3.2)	0	0	0	0	0
32	1.8 (10.0)	0.6 (3.2)	0.6 (3.2)	0	0	0
34	0	0.5 (3.2)	0	0	0	0.5 (3.2)
36	0.4 (3.2)	0.4 (3.2)	0	0	0	0
38	0.4 (3.2)	0	0	0	0	0
40	0	0	0	0	0.4 (3.2)	0.4 (3.2)
42	1.0 (10.0)	0	0.3 (3.2)	0	0	0
44	0.3 (3.2)	0	0	0	0	0
Total All Classes	19.7 (75.6)	2.7 (12.8)	2.1 (9.6)	7.9 (9.6)	0.4 (3.2)	3.2 (9.6)

Table 4: Mean number of trees and square foot basal area (in parenthesis) per acre by DBH, tree species, and condition for J7U Sale #3. The Unit is 35 acres in size.

DBH Class	Douglas-fir Live	Western Hemlock Live	Grand Fir Live
20	0	0	0
22	1.2 (3.2)	0	0
24	0	0	0
26	0	0	0
28	0	0	0
30	0	0	0
32	1.8 (10.0)	0	0
34	0.5 (3.2)	0	0
36	0.4 (3.2)	0	0.4 (3.2)
38	0.4 (3.2)	0	0
40	0	0	0
42	0.3 (3.2)	0	0
44	0	0	0
46	0	0	0
48	0	0.2 (3.2)	0
50	0	0	0
52	0	0	0
54	0	0	0
56	0	0	0
58	0	0	0
60	0.2 (3.2)	0	0
Total All Classes	4.8 (29.2)	0.2 (3.2)	0.4 (3.2)

Table 5: Mean number of trees and square foot basal area (in parenthesis) per acre by DBH, tree species and condition for J7U Sale Unit #2. The Unit is 27 acres in size.

DBH	Douglas-fir			Western Hemlock	Grand Fir
Class	Healthy	Live with *P. weirii*	Dead with *P. weirii*	Live	Live
8	0	0	0	0	0
10	0	0	0	0	0
12	0	0	0	0	3.6 (2.8)
14	0	0	0	2.6 (2.8)	0
16	0	0	0	0	0
18	1.6 (2.8)	0	0	0	0
20	1.3 (2.8)	0	0	0	0
22	0	0	0	0	0
24	0.9 (2.8)	0	0	0	0
26	1.4 (5.2)	0	0	0	0
28	0.6 (2.8)	0	0	0	0
30	0	0	0	0	0
32	0.9 (5.2)	0.5 (2.8)	0.5 (2.8)	0	0
34	0.8 (5.2)	0	0.4 (2.8)	0	0
36	0.7 (5.2)	0	0	0	0.4 (2.8)
38	0	0	0	0	0
40	0.6 (5.2)	0	0	0	0
42	0	0	0	0	0
44	0.3 (2.8)	0	0	0	0
Total All Classes	9.1 (40.0)	0.5 (2.8)	0.9 (5.6)	2.6 (2.8)	4.0 (5.6)

Table 6: Mean number of trees and square foot basal area (in parenthesis) per acre by DBH, tree species, and condition for Sugar Loaf Sale Unit #2. The Unit is 40 acres in size.

DBH Class	Douglas-fir		Western Hemlock
	Live	Bark Beetle Killed	Live
8	0	0	0
10	0	0	0
12	0	0	0
14	0	0	0
16	0	0	3.4 (4.8)
18	0	0	0
20	4.6 (10.0)	0	0
22	0	0	0
24	0	0	0
26	4.0 (14.8)	1.3 (4.8)	0
28	1.1 (4.8)	0	0
30	0	0	0
32	2.6 (14.8)	0	0
34	0.8 (4.8)	0	0
36	0	0	0
38	0.6 (4.8)	0	0
40	0	0	0
42	0.5 (4.8)	0	0
Total All Classes	14.2 (58.8)	1.3 (4.8)	3.4 (4.8)

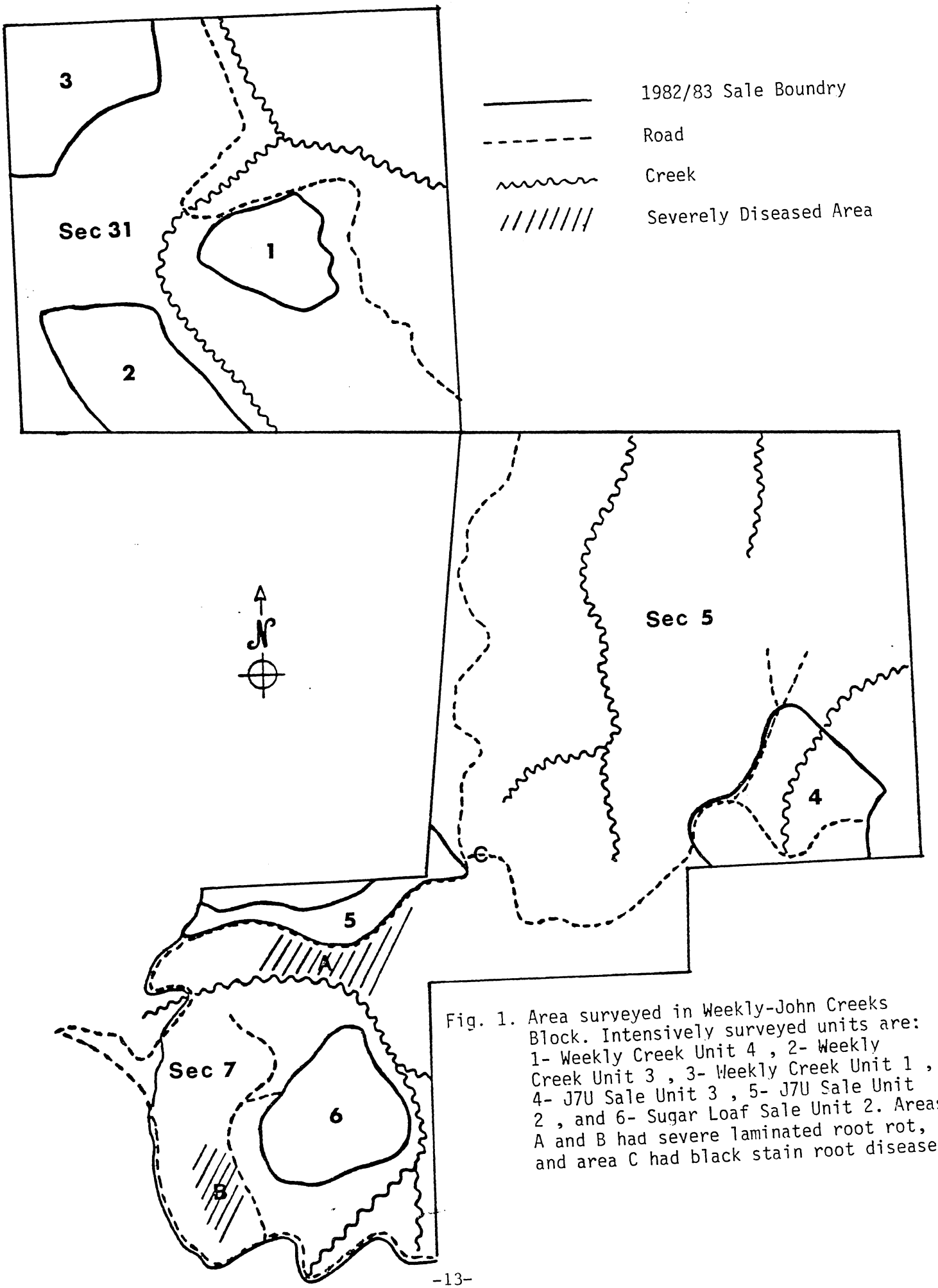

Fig. 1. Area surveyed in Weekly-John Creeks Block. Intensively surveyed units are: 1- Weekly Creek Unit 4 , 2- Weekly Creek Unit 3 , 3- Weekly Creek Unit 1 , 4- J7U Sale Unit 3 , 5- J7U Sale Unit 2 , and 6- Sugar Loaf Sale Unit 2. Areas A and B had severe laminated root rot, and area C had black stain root disease

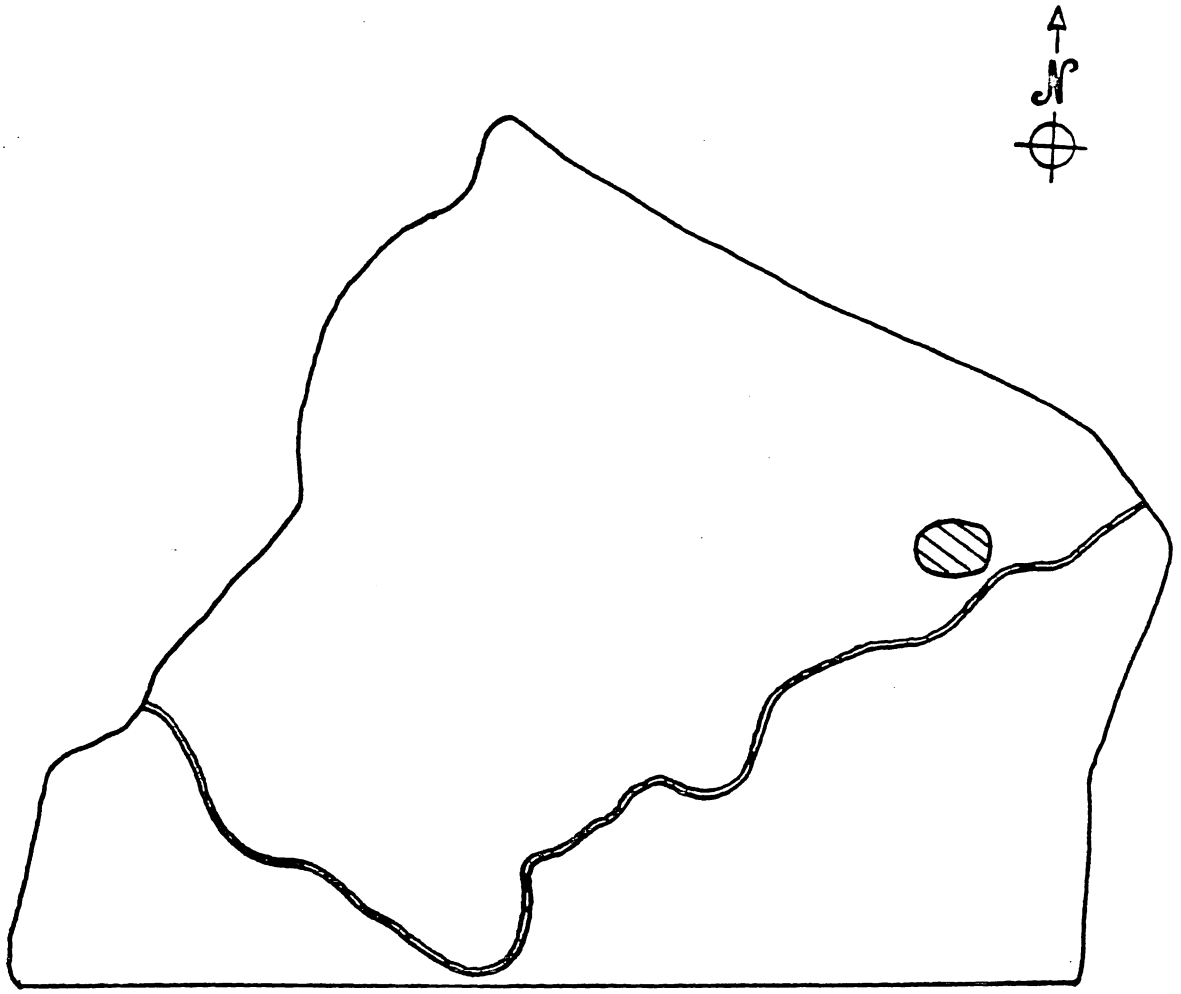

Fig. 2. Location of laminated root rot (cross-hatched area) in J7U Sale Unit 3. Scale is approximately 300 feet to the inch.

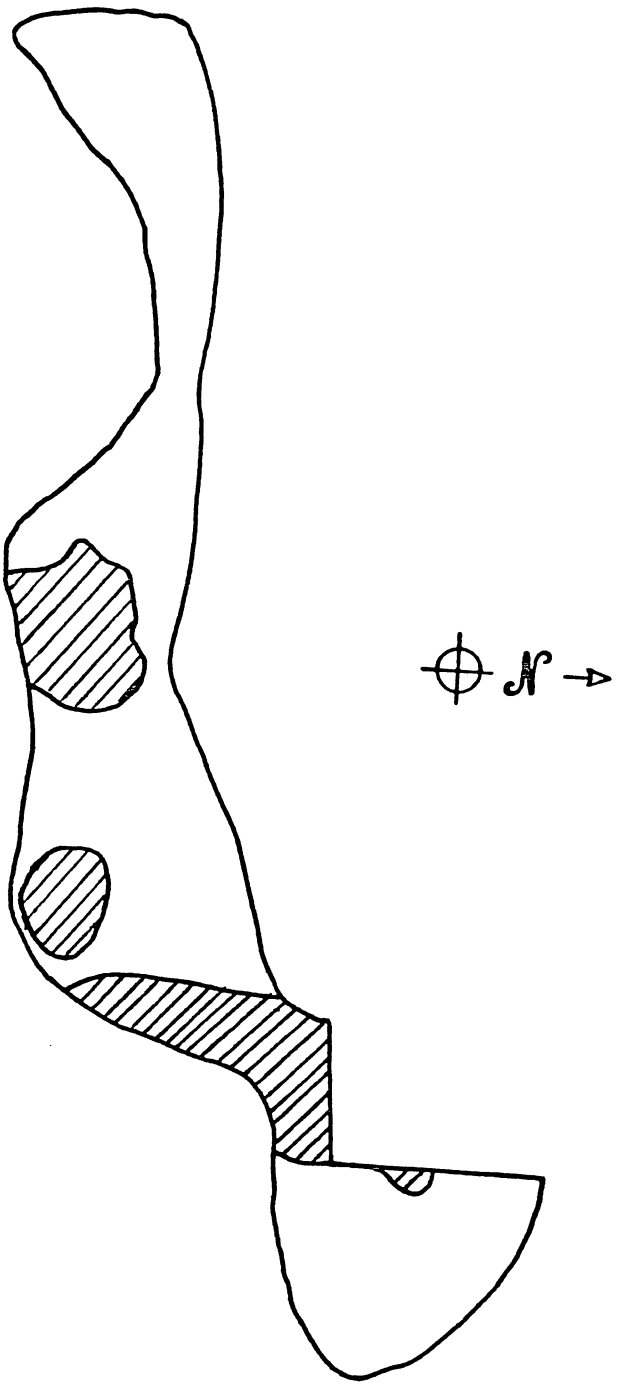

Fig. 3. Location of laminated root rot (cross-hatched areas) in J7U Sale Unit 2. Scale is approximately 500 feet to the inch.